JAMES THOMPSON – Pierce County, Washington

BEACH RESTORATION REPORT

Prepared By:

Curtis Wambach, M.S.
Senior Biologist and Principal

EnviroVector
OPTIMIZE USABLE LAND

8 January 2016

JAMES THOMPSON

BEACH RESTORATION REPORT

Prepared For:

Mr. James Thompson
Thompson Land LLC
35 Front Street
Issaquah, WA 98027

Prepared by:

Curtis Wambach, MS
Senior Biologist and Principal

EnviroVector
Lacey, WA 98503

8 January 2016

EXECUTIVE SUMMARY

SITE NAME:	James Thompson
SITE LOCATION:	The 1.23-acre subject property (#0121107002, 0.60 acre & #0121107001, 0.63 acre) is located on Rosedale Bay CT NW, Pierce County, Washington in Section 3, Township 21 North, Range 1, Willamette Meridian (Figure 1).
DRIVING DIRECTIONS:	From I-5, take exit 132 in Tacoma at 38th Street, follow signs for Highway 16, merge onto Highway 16, continue on highway 16 for approximately 10 miles, take the Wollochet Drive NW Exit toward City Center, continue onto Stinson Avenue, after 0.6 miles, turn left onto Rosedale Street NW, after 2.9 miles turn left onto Ray Nash Drive NW, continue straight onto Kopachuck Drive NW, turn right onto Rosedale Bay Ct NW, turn right at the fork, continue to gravel driveway, destination will be on the left.
LEGAL DESCRIPTION:	Section 10 Township 21 Range 01 Quarter 32: L 2 OF SHORT PLAT 76-96 SEE UND INT IN 3-072 PER 678402 OUT OF 3-060 (DCJEAEMS209082).
PREPARED FOR:	James Thompson
PROJECT STAFF:	Curtis Wambach M.S., Senior Biologist and Principal
FIELD INVESTIGATION:	19 October 2015

SUMMARY: Neighbors of my Client James Thompson, the Complainants, filled the natural channel of a Lagoon without permits, which caused loose beach sand to erode and ultimately a new channel to form on the narrow sand bar. My Client anchored driftwood logs and stacked beach rocks to prevent the erosion. The neighbor's hired a consultant that complained to the County and to the Corps of Engineers. The Corps of Engineers ordered My Client to remove the erosion control efforts and move the loose beach sand back to the new lagoon channel. However, a multiagency agreement was reached on 19 October 2015 to restore the original outlet that was filled by the Complainants without permits as part of this plan. By restoring the original outlet, the plan can avoid take of Federally-listed species that may utilize the lagoon as foraging and rearing habitat and can maintain the vibrant intertidal ecosystem within the lagoon.

TABLE OF CONTENTS

1.0 INTRODUCTION

The Corps of Engineers requested in their 4 December 2015 letter that the channel to a saltwater lagoon be filled and that the marine connection that shelters a myriad of dependent intertidal and near-shore species, including potential Federally-listed salmonid species, be eliminated.

However, an agreement was reached between all parties at the 19 October 2015 multi-agency meeting that the formation of the new channel and the filling of the original channel are interdependent and would be mitigated in tandem. Material to fill the existing channel would come from the original channel that was filled by the Complainants without permits and without Endangered Species Act Consultation. This would link all actions on the sandbar and lagoon together as one action without the uncertain outcome that would result from piecemealing smaller unrelated actions at different times. Thereby, removing existing anchored driftwood logs would be performed in conjunction with filling of the existing channel and restoration of the old channel. Performing the work as one action eliminates the potential liability of 'take' to Federally-listed fish species that are likely utilizing the lagoon as habitat under its current condition.

Sediment from the location of the new channel washed away and now is located in the area of the original, natural channel. This plan proposes to transport some of this loose sand and gravel from the location of the original channel back to the location of the new channel. As discussed during the 19 October 2015 meeting, the entire sand bar had shifted when the original channel was filled without permits by the Complainants, which changed the direction of long-shore drift transporting near-shore sediment.

Sediment from the new channel is located at the old channel. The best and perhaps only way to restore this sand bar to its previous natural condition is to take the sediment that drifted from the location of the new channel and move it back. This drifted sediment is currently located in the area of the old channel.

My Client prefers not to destroy the lagoon and cause take to Federally-listed salmonid species. If no channel exists on the lagoon, stagnant water will destroy this vibrant ecosystem that has thrived since a connection with marine waters was restored to its previous natural condition. My Client does not want to be responsible for destroying an important and vibrant ecosystem that currently provides rearing habitat for salmonid fishes. My Client is worried that filling the channel may cause take to ESA listed salmonid fish species that may utilize this channel to access foraging and rearing habitat in the lagoon. These species would be trapped in the lagoon and parish from stagnant water and from the lack of access to marine waters.

When the Complainants filled the original channel, the lagoon lost its connection with marine waters. Fish trapped in the lagoon would have surely perished. The elimination of this marine connection contributed to the degradation of valuable salmonid rearing habitat in Puget Sound. Other valuable marine habitat for a myriad of species also was lost.

By asking my Client to close off the lagoon to an unnatural condition without reopening the original channel filled by the Complainants, the Corps also would be asking my Client to cause the potential for take of ESA listed fish species. Thereby, both actions, opening the original

channel and filling the new channel, are interdependent and it is essential for both actions to be addressed in tandem.

Background History

A natural outlet occurred on the northeastern end of the lagoon (**Insert 1**). This outlet had been filled and a culvert was installed by the Complainants without permits (**Insert 1**). Best available knowledge suggests that the outlet was filled around 1992/93. Sediment began to accumulate at the historical outlet near the location of unpermitted fill. This accumulation of sediment can be seen in **Insert 1**. The natural breach in the lagoon began to form shortly after the outlet was filled. **Insert 1** shows an aerial photo where the breach can be seen forming in 2005/2006. However, an aerial photograph in **Appendix G** shows a weak point in the lagoon sand bar as early as 1990. This weak point is in the location where the beach occurred, indicating that the precursor to the breach was well underway as far back as 1990, before Mr. Thompson purchased the property. As such, it is unlikely that Mr. Thompson was responsible for this breach.

Insert 1. Fill of lagoon outlet caused changes to beach and a shifting of sediment

Estimated 2005-2006 (Shows beginning of natural breach of dune)

County Intervention in 2009

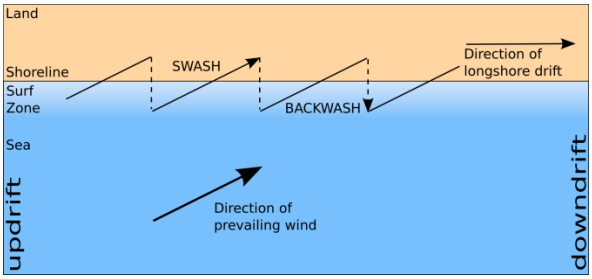
Mr. Thompson was instructed by the County in 2009 to remove erosion control measures that he installed on the beach to protect the lagoon. In a number of emails at that time, Mr. Thompson warned the County that significant erosion would occur if the erosion control measures were removed. He told the County that he would hold them responsible for the erosion to the beach that would surely occur if the erosion control measures were removed. However, the County responded to Mr. Thompson in an email dated 12 October 2009 by telling Mr. Thompson to remove the erosion control measures and to 'let nature take its course'.

Nature has taken its course. And now, Mr. Thompson finds himself in the same place as in 2009. These reported accusations are part of an ongoing conflict with neighbors and should not be treated as an alleged violation. This ongoing conflict began when the Complainant refused to maintain the culvert that provided a connection to marine waters. This culvert was installed by the Complainants when they filled the original channel without permits.

However, my Client and the Complainant resolved this issue during the 19 October 2015 on-site meeting with multiple agencies, including Pierce County, Department of Ecology, Washington Department of Fish and Wildlife, and the US Army Corps of Engineers. All parties had come to an agreement that would resolve this ongoing conflict and maintain that natural intertidal habitat within the lagoon.

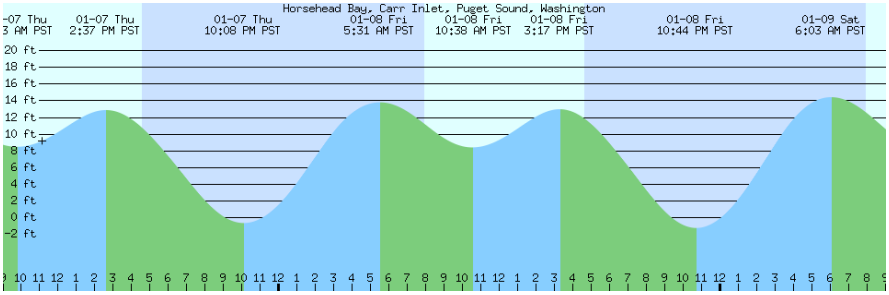
Facts and Definitions:

Longshore Drift: the transportation of sediments along a coast at an angle to the shoreline, which is dependent on prevailing wind direction, swash and backwash. This process occurs in the littoral zone, and in or close to the surf zone.



Tide at Site: Tides at the site can fluctuate by more than 14 feet daily.

Horsehead Bay, Carr Inlet, Puget Sound, Washington Tide Chart
Local time: 2016-01-07 Thu 11:10 AM PST



Complainants: The parties that reported alleged regulated activities performed without permits to regulatory agencies.

2.0 SITE DESCRIPTION & LOCATION

Site Location

The 1.23-acre subject property (#0121107002, 0.60 acre & #0121107001, 0.63 acre) is located on Rosedale Bay CT NW, Pierce County, Washington in Section 3, Township 21 North, Range 1, Willamette Meridian (**Figure 1**).

Site Description

The subject property consists of two parcels totaling 1.23 acres in size (**Figure 2 & 3**). The majority of the subject property is located waterward of the mean high water mark (MHWM). A small maintained area on the site contains a camper and picnic table. An old road is maintained as a grass path along the shoreline edge. According to the property owner, the old road once was a highway constructed of red bricks. These red bricks can be found on the shoreline.

Vegetation located on the subject property consists of:

- Evergreen huckleberry (*Vaccinium ovatum*)
- Salal (*Gaultheria shallon*)
- Douglas fir (*Pseudotsuga menziesii*)
- Pacific Madrona (*Arbutus menziesii*)
- Bracken fern (*Pteridium aquilinum*)
- Lawn grasses
    - Common bentgrass (*Agrostis tenuis*)
    - Quackgrass (*Agropyron repens*)
    - Velvet grass (*Holcus lanatus*)
- Beach grass (*Ammophila breviligulata*)
- Cat's ear (*Hypochaeris radicata*)
- Salmonberry (*Rubus spectabilis*)
- Baldhip rose (*Rosa gymnocarpa*)
- Snowberry (*Symphoricarpos albus*)
- Western red cedar (*Thuja plicata*)
- Sword fern (*Polystichum munitum*)
- Red huckleberry (*Sambucus racemosa*)
- Some pickle weed (*Salicornia virginica*) occurs below the MHWM

The surrounding properties contain relatively large estates, manicured lawns, tennis courts, orchards, swimming pools, and landscaped areas. Raft Island is located approximately 1,000 feet north of the subject property across the bay. Cutts Island State Park can be seen from the shoreline west of the subject property.

A saltwater lagoon is located on the central portion of the subject property. The water level in the lagoon is determined by tidal action. The subject property is located on Carr Inlet of Puget Sound. The closest town is Rosedale to the north and Gig Harbor is located approximately 4.5 miles east of the subject property.

3.0 EXISTING CONDITIONS

3.1 Background Information

National Wetlands Inventory

No wetlands have been identified on the subject property by the National Wetland Inventory (NWI) map (**Appendix B**). However, a Estuarine Intertidal Unconsolidated Shore Regularly Flooded (E2USN) wetland has been identified in marine waters offsite north of the subject property.

WDFW PHS Database

No wetlands have been identified on the subject property by the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) database (**Appendix C**). However, marine wetlands have been mapped by the database north of the subject property. No priority species have been mapped within one mile of the subject property.

DNR Natural Heritage Database

The Natural Heritage Database maps Puget Sound and the lagoon as wetlands (**Appendix D**).

Natural resources conservation service (NRCS) Soils Map

Soils on the site consist of Bow silt loam 8 to 15% slopes (**Appendix D**). Although this soil type is listed as hydric, the site is well drained and contains upland vegetation.

Pierce County GIS Database

The on-site lagoon is identified as a wetland by the Pierce County GIS (**Appendix E**). The database also identifies marine wetlands north of the subject property consistent with other databases.

Shorelines

The shoreline designation at the subject property is 'Rural Residential' (**Appendix F**). Under Pierce County Code 20.10.030(A)---*preferred uses,* the preferred use is single family. Under Pierce County Code 20.10.010(C)---*Special Setbacks for Shoreline Sites***,** the Rural Residential designation allows medium intensity residential.

Under Pierce County Code 20.62.050(C)---*Special Setbacks for Shoreline Sites,* The required setback for buildings and structures from any lot line or lines abutting the ordinary high water line or lawfully constructed bulkhead shall be 50 feet except that the special shoreline setback shall not apply to docks, floats, buoys, bulkheads, launching ramps, jetties and groins.

Under Pierce County Code 20.62.050(C)(2)---*Bulk Regulations*: *Exceptions to the Special Setbacks for Shoreline Sites*, **a**ny water dependent accessory use may be allowed within the 50 foot setback upon the issuance of a Conditional Use Permit.

Under the shoreline regulations of the Pierce County Code Chapter 20.62.020---*Rural Development Permit Exemptions*, exempt activities from a Shoreline Substantial Development Permit includes the construction of a single family residence by an owner, lessee, or contract purchaser for his own use or the use of his family, if said residence does not exceed a height of 35 feet above average grade level.

3.2 Onsite Conditions

Connection to Marine Waters is Natural Condition of Lagoon

An intertidal connection to marine waters is the natural condition of the lagoon prior to the filling of the original outlet by the Complainant perhaps in the early 1990s (**Insert 1, Figure 3, & Appendix G**). The original culvert and armoring remain easily observable at the northeastern tip of the lagoon (**Appendix A, Photos 1, 3, 4-6**). After the natural outlet was filled on the northeastern tip of the triangular-shaped lagoon, the marine ecosystem within the lagoon collapsed and salmonid fish rearing habitat was lost. Tidal action through the original channel no longer washed away sediment from this area, which changed the movement of sediment along the entirely of the sand bar (**Appendix G**).

The Complainants installed an undersized culvert in place of the natural outlet. My Client maintained the culvert after the Complainants refused responsibility of continued maintenance (**Appendix A, Photos 3, 13, & 14**). The accumulation of sediment accelerated after 2006 when maintenance discontinued and, subsequently, the culvert was permanently buried. Sediment moved northeast along the shoreline from the location of the current outlet to the location of the original outlet through tidal action and longshore drift (**Appendix G**). Sediment from the new channel washed away and settled at the northeastern end of the lagoon at the location of the original channel.

Marine Tidally Influenced Lagoon (Not freshwater Wetland)

The Complainant's consultant argues that the lagoon is a freshwater wetland and has always been a freshwater wetland. However, this is not true. No streams, springs, or other source of fresh water has been demonstrated. The lagoon originally had a connection to marine waters and provided intertidal habitat for marine and intertidal species. After the Complainants filled the natural outlet, the hydrology in the lagoon continued to remain influenced by marine waters. Even after the original channel was filled, waters of Puget Sound passed through the narrow band of loose sand and gravel that forms the sand bar, controlling salinity and water levels in the lagoon.

The salt tolerant plant pickleweed (*Salicornia virginica*) is found within the lagoon. Only salt tolerant plants are found within the lagoon. No non-salt tolerant plants were identified within the lagoon. No non-salt tolerant plants occured in the lagoon prior to the establishment of the new channel.

No freshwater source and no non-salt tolerant plants demonstrate that the lagoon is not and was now a freshwater wetland. It is a saltwater intertidal system that historically maintained an open connection to marine waters, similar to its current condition.

Marine Beach is Dynamic System

The marine beach at the subject property consists of dynamically shifting loose sand and gravel controlled by tidal action and long-shore drift (**Appendix G**). The loose sand on the marine beach does not form a stable structure and has not historically. This sediment is constantly shifted by tidal action, which can fluctuate by more than 14 feet daily, and by long-shore drift, which moves sediment along the beach from southwest to northeast.

The beach at the lagoon is a dynamic system that is affected by natural and artificial influences, including currents, longshore drift, and tidal action. The filling of the lagoon's natural channel has caused sediment to accumulate at the old channel location (**Insert 1, Appendix G**). The accumulation of sediment accelerated after 2006 when the culvert was buried and maintenance discontinued. Prior to the filling of the natural outlet, this sediment was washed out with tidal action. However, when the outlet was filled, the tidal action that cleared this sediment was lost and the dynamics of tidally shifting sediment dramatically changed.

The accumulation of this sediment has altered nearshore marine currents and longshore drift. A breach formed naturally in a weak portion of the sand bar that can be seen in aerial photos as far back as 1990 (**Insert 1, Appendix G**). Tidal action contributed to breach enlargement. My Client tried to prevent further erosion by anchoring driftwood logs and by stacking beach rocks. However, the erosion continued.

Marine Access to Lagoon Provides Salmonid Habitat

Tidal lagoon habitats are as valuable for salmonid health as they are rare in the Puget Sound. Historically, before the filling of the natural outlet, the lagoon provided a significant rearing and foraging habitat for Puget Sound salmonids, serving as one of the most important habitat types for salmonids in Puget Sound. NOAA Fisheries states that marine connected lagoons are valuable habitat for migrant salmonid fry in Puget Sound (NOAA Fisheries 2006). The Wild Fish Conservancy reports that lagoons connected to waters of Puget Sound provide a diversity of rearing and foraging habitats for salmonids as they migrate to the Pacific Ocean (Wild Fish Conservancy 2007).

Marine lagoons trap nutrients and organic material utilized by the benthic and planktonic communities, forming the base of a food web that supports populations of anadromous salmonids (NMFS 1995). Juvenile Chinook salmon, *Oncorhynchus tshawytscha*, typically reside in estuaries and marine lagoons longer than do other species of anadromous salmonids (NMFS 1995). This is extremely important because Federally-listed Chinook salmon have the potential to occur in the lagoon and to use the lagoon for foraging and juvenile rearing habitat.

A variety of salmonid species may utilize the lagoon as foraging and rearing habitat, accessing the lagoon through its current marine connection to Puget Sound (**Table 1, Appendix H**).

Federally listed species, namely Chinook salmon, bull trout (*Salvelinus confluentus*), and steelhead trout (*Oncorhynchus mykiss*), may utilize the lagoon for foraging and rearing habitat. Chinook salmon and bull trout Critical Habitat occurs at the lagoon and may include the lagoon (**Appendix H**). Thereby, filling in the existing channel that allows Federally-listed species to utilize the lagoon as Critical Habitat may cause a take to Federally-listed species and violate the Endangered Species Act (ESA). My Client proposes to re-open the original channel of the lagoon, as agreed upon by all parties during the 19 October 2014 multi-agency meeting, to avoid a take of Federally-listed species and to avoid violating the ESA.

Table 1. Potential Salmonids Occurring in Lagoon

Common Name	Scientific Name	ESU at Site	Federally -listed[1]	State-listed[2]	Priority Species	Critical Habitat at Lagoon	Potential to occur in Lagoon
Coho Salmon	*Oncorhynchus kisutch*	Puget Sound	None	None	Yes	None	Yes
Chinook Salmon	*Oncorhynchus tshawytscha*	Puget Sound	T	SC	Yes	Yes	Possible
Chum	*Oncorhynchus keta*	Fall /Winter	None	None	Yes	None	Possible
Pink Salmon	*Oncorhynchus gorbuscha*	Odd year	None	None	Yes	None	Possible
Steelhead	*Oncorhynchus mykiss*	Puget Sound (Winter/Summer)	T	None	Yes	Nearby	Possible
Bull Trout	*Salvelinus confluentus*	Puget Sound	T	SC	Yes	Yes	Possible

1) T: Federally-listed as Threatened
2) SC: State Species of Concern

4.0 COMPLY WITH CORPS REQUEST

Avoid ESA Violation

As all parties are aware, the natural condition of the lagoon includes an open channel to Puget Sound. This channel was filled by the Complainants without a Corps permit. When the channel was filled, a culvert was installed to maintain the connection with Puget Sound. However, by filling the original channel, the flow of near-shore sediment was altered and eventually the culvert outlet was covered. Without that connection to marine waters, the lagoon ecosystem collapsed and this important fish rearing habitat was lost. However, when the connection to marine waters was re-established recently, the lagoon ecosystem also was re-established and came back to life. Fish rearing habitat also has been re-established. By filling in the current channel without re-opening the original channel, the lagoon ecosystem and this important fish rearing habitat would be lost again.

We believe that it is important to restore the lagoon to its natural condition, which includes a connection to marine waters. And, that it also is important not to destroy the lagoon habitat utilized by salmonid fish and a myriad of intertidally-adapted species. Permanently enclosing

fish in the lagoon or destroying fish habitat could result in the potential for take of Federally-listed salmonid species. Thereby, both actions, filling in the current channel, and reopening the original, natural channel, are interdependent and cannot be treated as two separate actions. The opening of the original channel must be paired with the filling of the current channel. If my Client is asked by the Corps to perform an action that may result in the violation of the ESA, then the US Fish and Wildlife Service and NOAA Fisheries should be consulted under Section 7 and 10 of the ESA.

Thereby, our proposal will include an interdependent action of reopening the original channel paired with the filling of the current channel. This would satisfy the Corps request to fill the new channel, while avoiding an ESA violation, and while being in compliance with the multi-agency agreement established during the 19 October 2015 on-site meeting.

The Creation of the New Channel

To minimize beach erosion, my Client anchored two driftwood logs and stacked beach rocks. No sediment was removed at the new channel. The new channel formed naturally through geological activity and natural earth processes, namely tidal influence and longshore drift, after the original channel was filled by the Complainant without permits.

5.0 CONCEPTUAL COMPENSATORY MITIGATION PLAN

Proposed action to comply with multi-agency agreement and request by US Army Corps of Engineers includes (**Figure 4**):

1) Remove anchoring of two driftwood logs at new channel,
2) Un-stack stacked beach rocks at new channel and place on the banks of restored old channel for stability (imported natural rock would be used to stabilize the restored channel as needed),
3) Fill the new channel by transporting 4,762 cubic feet of beach sand from the northeast of the lagoon to the new channel,
4) Anchor driftwood logs at new channel to prevent erosion, and
5) Install native dunegrass (*Elymus mollis*) in an area totaling 7,800 sf to stabilize shifting beach sand and gravel.

This plan is designed to preserve the existing intertidal habitat and the myriad of dependent intertidal species that currently reside in the lagoon. Eliminating the connection with Puget Sound would destroy this valuable ecosystem that provides essential nearshore foraging and rearing habitat for salmonid fishes, for which some are Federally-listed.

This plan avoids take of Federally-listed salmonid species that are expected to utilize the lagoon as foraging and rearing habitat. This plan also should not affect ESA Critical Habitat of Federally-listed fish species because salmonid foraging and rearing habitat would be preserved.

Because the shifting of sand and gravel on the sand bar is a dynamic natural process that is difficult to control or predict, success criteria of long-term monitoring is virtually impassible to

achieve. Predicting the movement of sand under the natural geological forces of tidal action, erosion, and longshore drift are unrealistic, similar to that of long range weather forecasts.

We propose continued coordination with the Complainant's consultant and with multiple agencies to ensure the long term success of the project. This would ensure the continued cooperation between my Client and the Complainant in order to avoid any similar or related disputes in the future.

6.0 SUMMARY AND CONCLUSION

A multi-agency agreement was established during the 19 October 2015 on-site meeting to resolve all issues associated with the formation of the new channel connecting the lagoon to Puget Sound. The agreement is to fill the new channel on the lagoon and reopen the original channel concurrently. This interdependent action would be accomplished by transporting 4,762 cubic feet of beach sand and gravel from the location of the old channel to the location of the new channel (**Figure 4**). Regulatory agencies and both parties present at the meeting have agreed on the resolution to restore the original channel of the lagoon and to transport the excavated sediment to the new channel. All parties have agreed on this action as the best solution to resolve this issue.

This plan would avoid take of Federally-listed salmonid species and retain existing salmonid foraging and rearing habitat within the lagoon. This plan would preserve the diversity of intertidal species by preserving the existing intertidal habitat. My Client believes that destroying the existing important intertidal habitat is not a good option and wishes to avoid a take of Federally-listed fish species, which can be achieved through this plan.

7.0 REFERENCES

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Figures

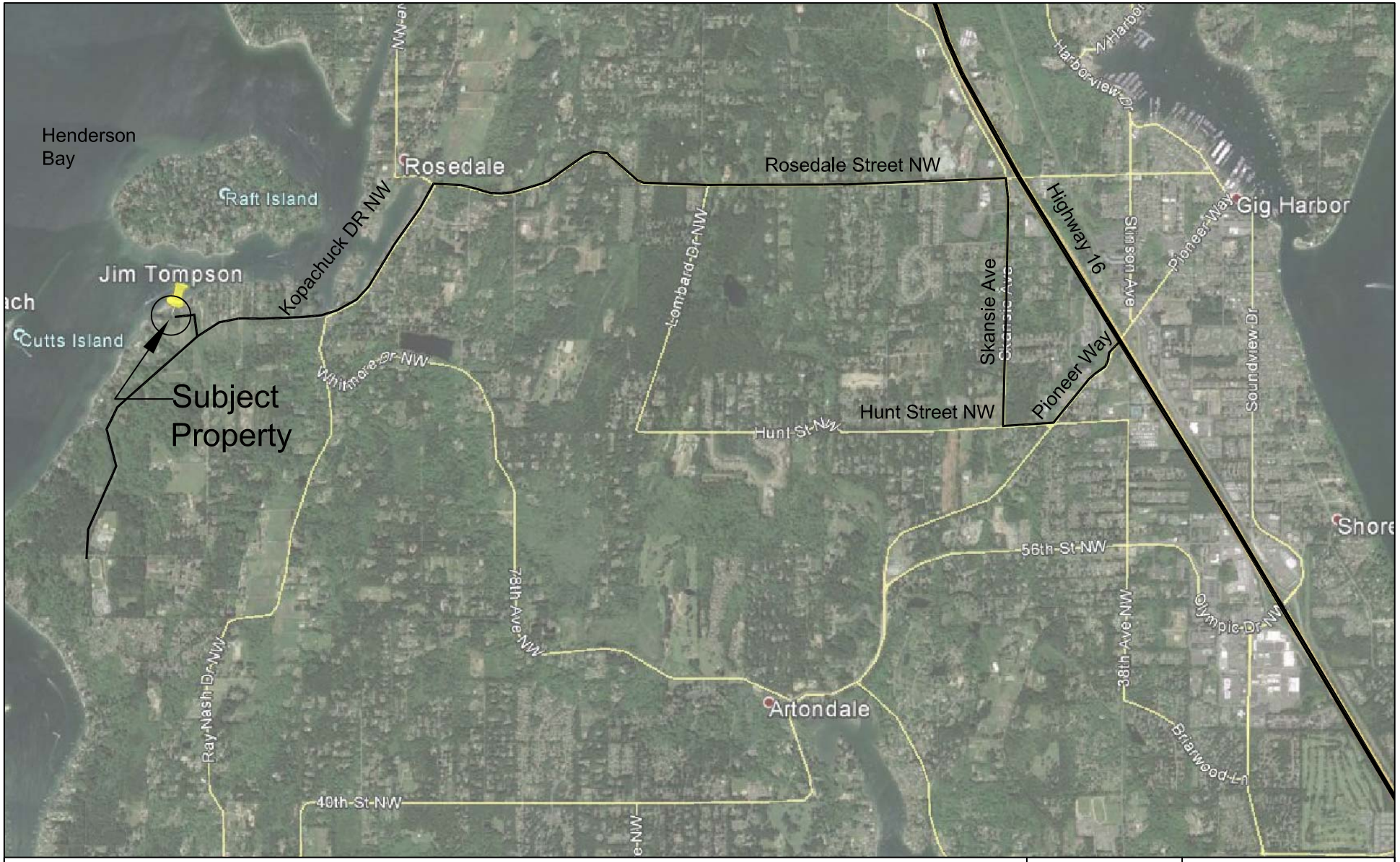

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Figure 1

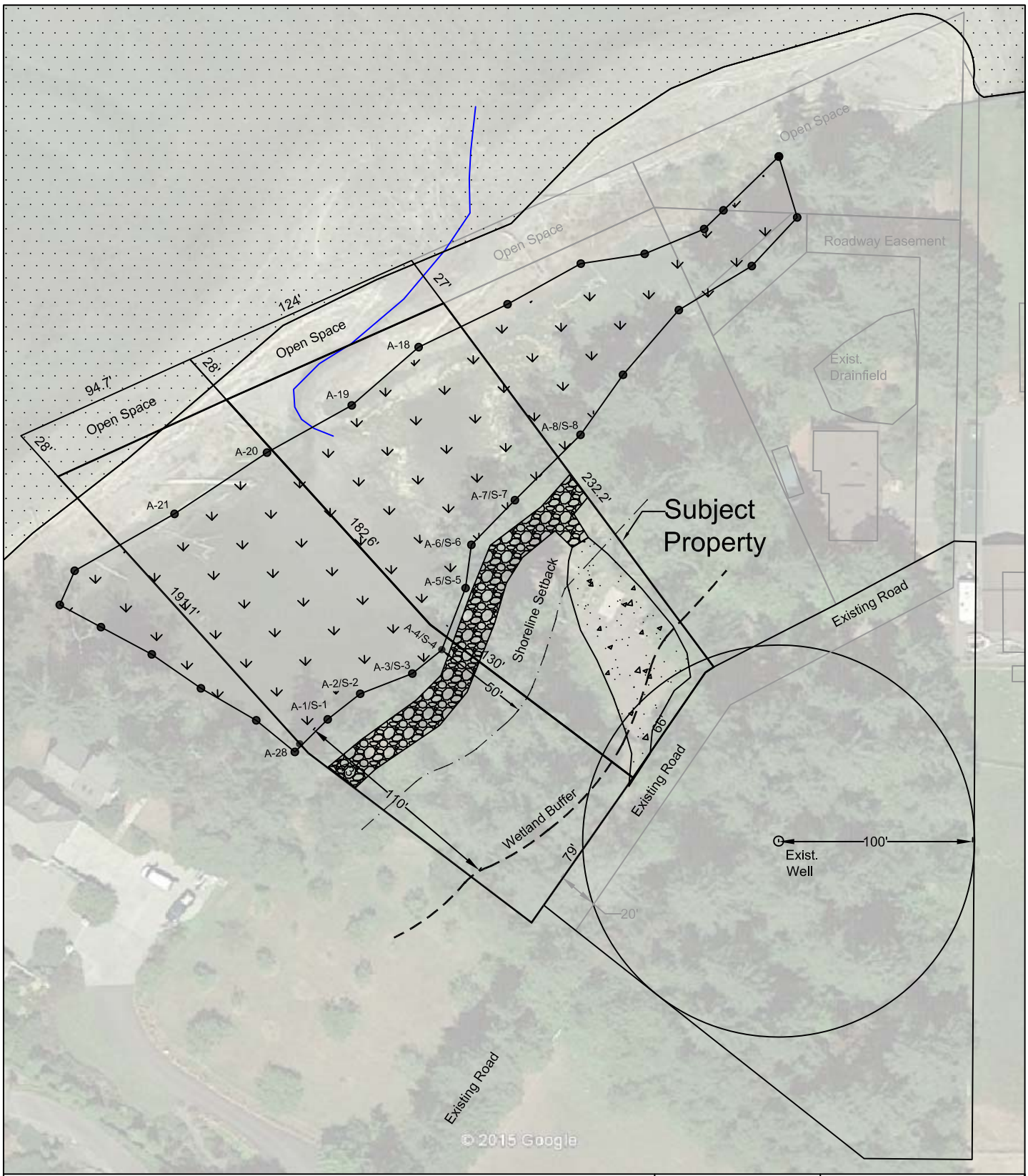
Jim Thompson

Vicinity Map

Scale: 1" = 3,000'

0 3,000'

10 July 2015



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S-1 S-2 Delineation

Shoreline Setback 50'

Wetland Buffer 110'

Marine Waters

Existing Gravel

Delineated Marine Wetland

Exist. Path On Old Road

Figure 2

Jim Thompson

Existing Conditions

Scale: 1" = 70'

0 70'

8 January 2016

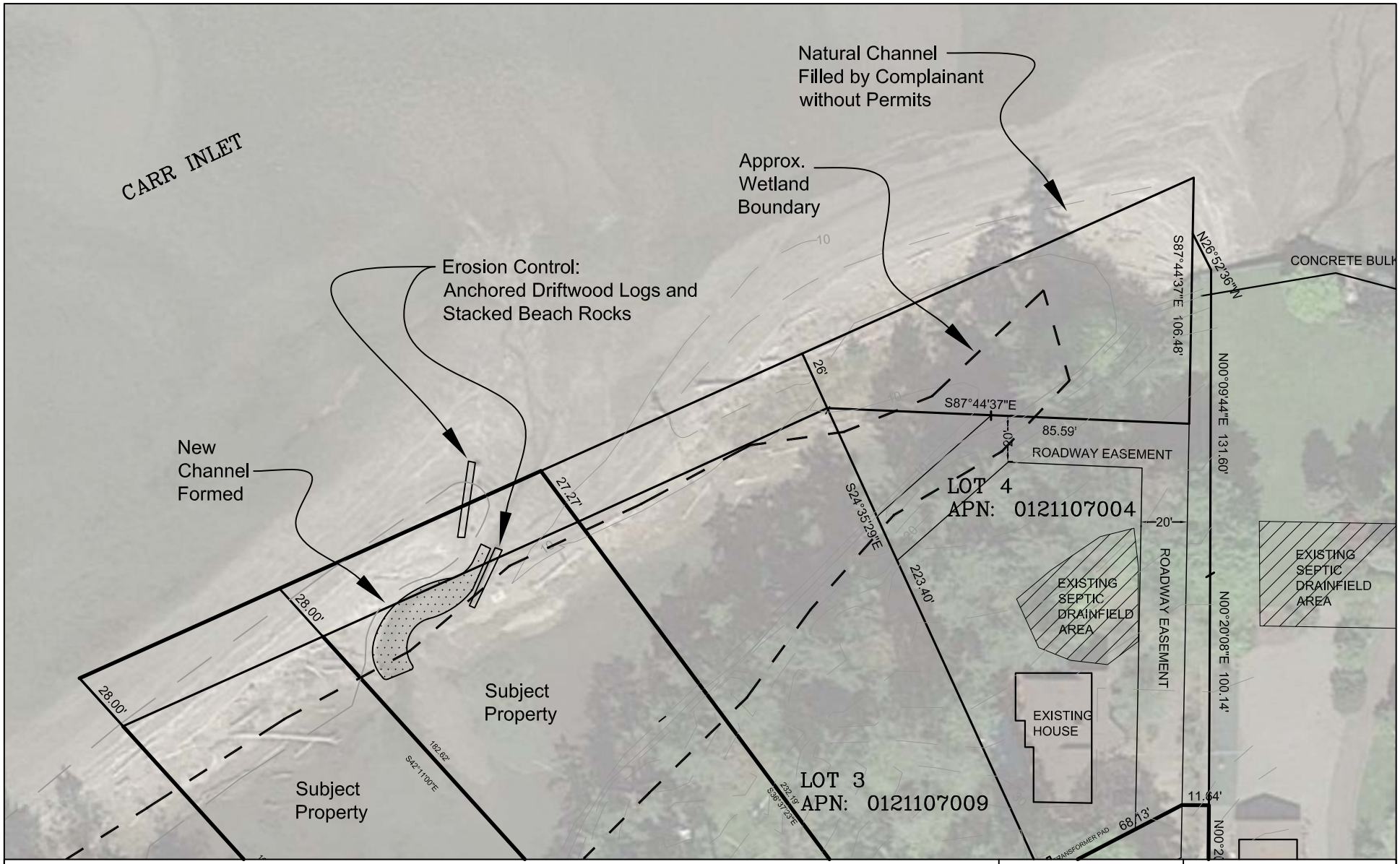

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Figure 3

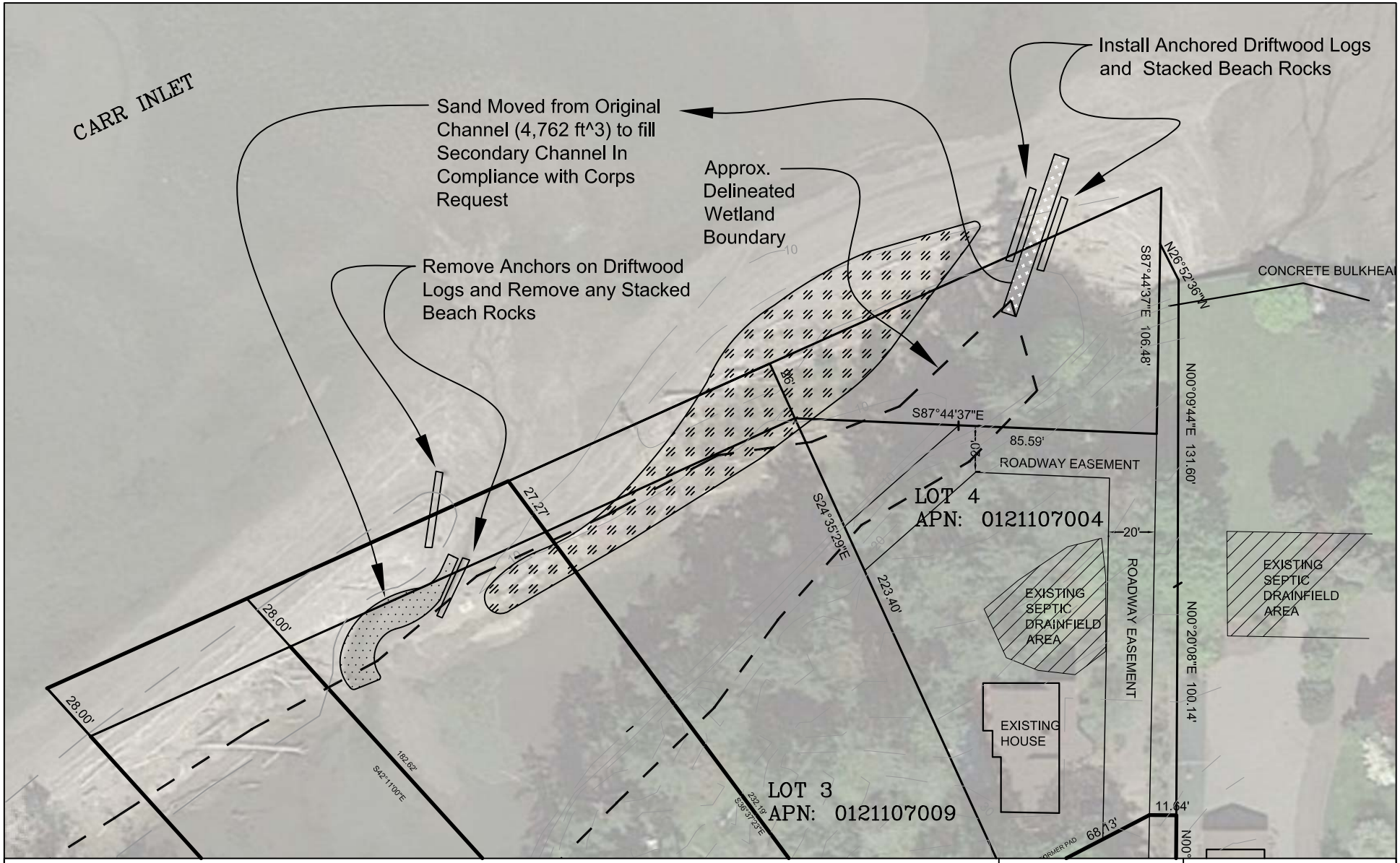
Jim Thompson

Existing Beach

Scale: 1" = 60'

0 60'

8 January 2016



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Fill Channel (4,762 ft^3, 862 sf)

Install native dunegrass to stabilize shifting beach sand (7,800 sf)

Figure 4

Jim Thompson

Mitigation Plan

Scale: 1" = 60'

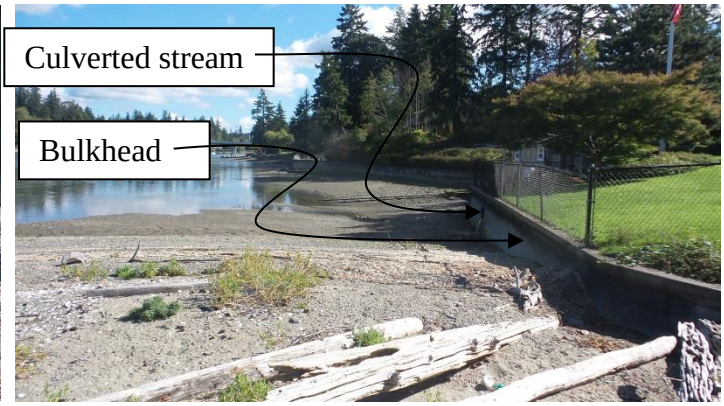
0 60'

5 January 2016

APPENDIX A

Photographs

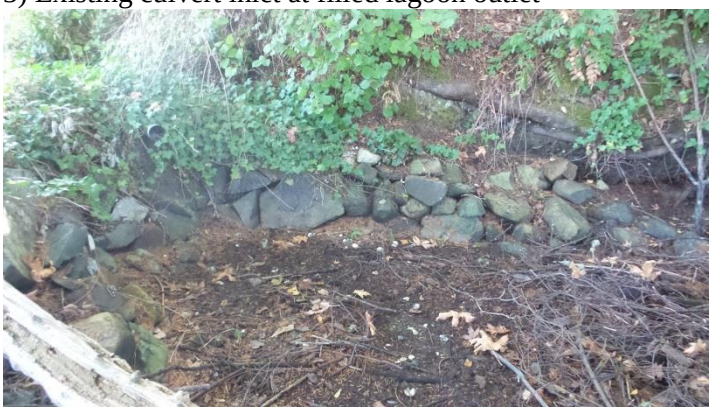
1) Shovel marks Current location of lagoon culvert



2) Location of filled outlet

3) Existing culvert inlet at filled lagoon outlet

4) Armoring at filled lagoon outlet



5) Armoring at filled lagoon outlet

6) Armoring at filled lagoon outlet

7) Bulkhead at filled lagoon outlet

8) Erosion at the beach

9) Pickleweed on the beach and in the lagoon at channel

10) lagoon channel

11) Sediment deposited, facing SW neighbor's armoring

12) Facing SW neighbor's armoring

13) Mr. Thompson digging out culvert 2004

14) Mr. Thompson digging out culvert 2004

APPENDIX B

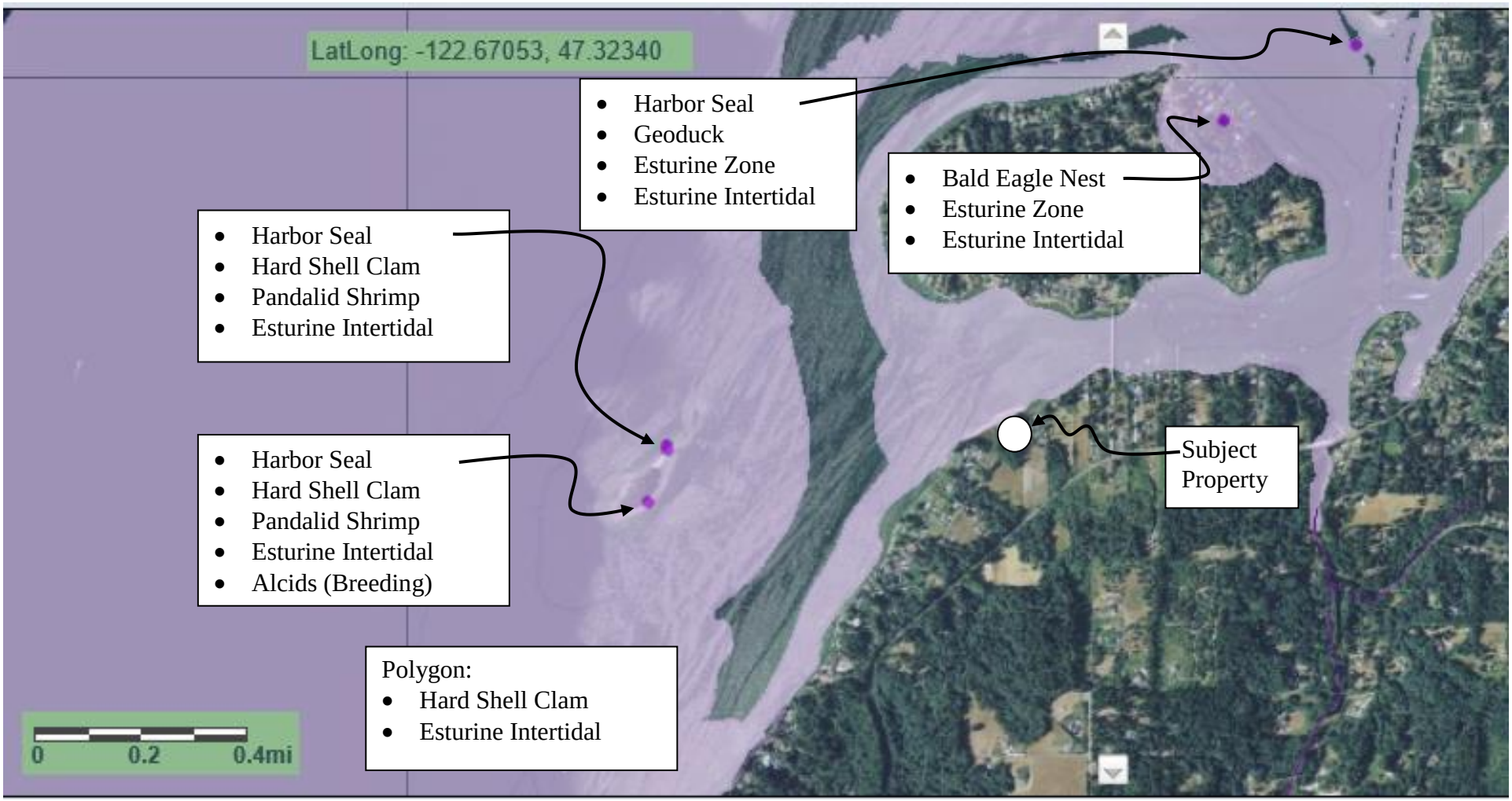
National Wetlands Inventory (NWI) Database


10/18/2011 12:01 pm
10/18/2011
10/27/2011
E2USN
Madrona Dr
Rafe Island Rd
Subject Property
Rosedale Bay Ct NW
Kopachuck Dr NW
1021 ft
1990
© 2013 Google
Google earth
Imagery Date: 5/4/2013 47°19'20.77" N 122°40'25.20" W elev 12 ft eye alt 4411 ft

APPENDIX C

Washington Department of Fish and Wildlife (WDFW)

Priority Habitats and Species Database


LatLong: -122.67053, 47.32340
Harbor Seal
Geoduck
Esturine Zone
Esturine Intertidal
Bald Eagle Nest
Esturine Zone
Esturine Intertidal
Harbor Seal
Hard Shell Clam
Pandalid Shrimp
Esturine Intertidal
Subject Property
Harbor Seal
Hard Shell Clam
Pandalid Shrimp
Esturine Intertidal
Alcids (Breeding)
Polygon:
Hard Shell Clam
Esturine Intertidal
0
0.2
0.4mi

APPENDIX D

Pierce County GIS Mapping

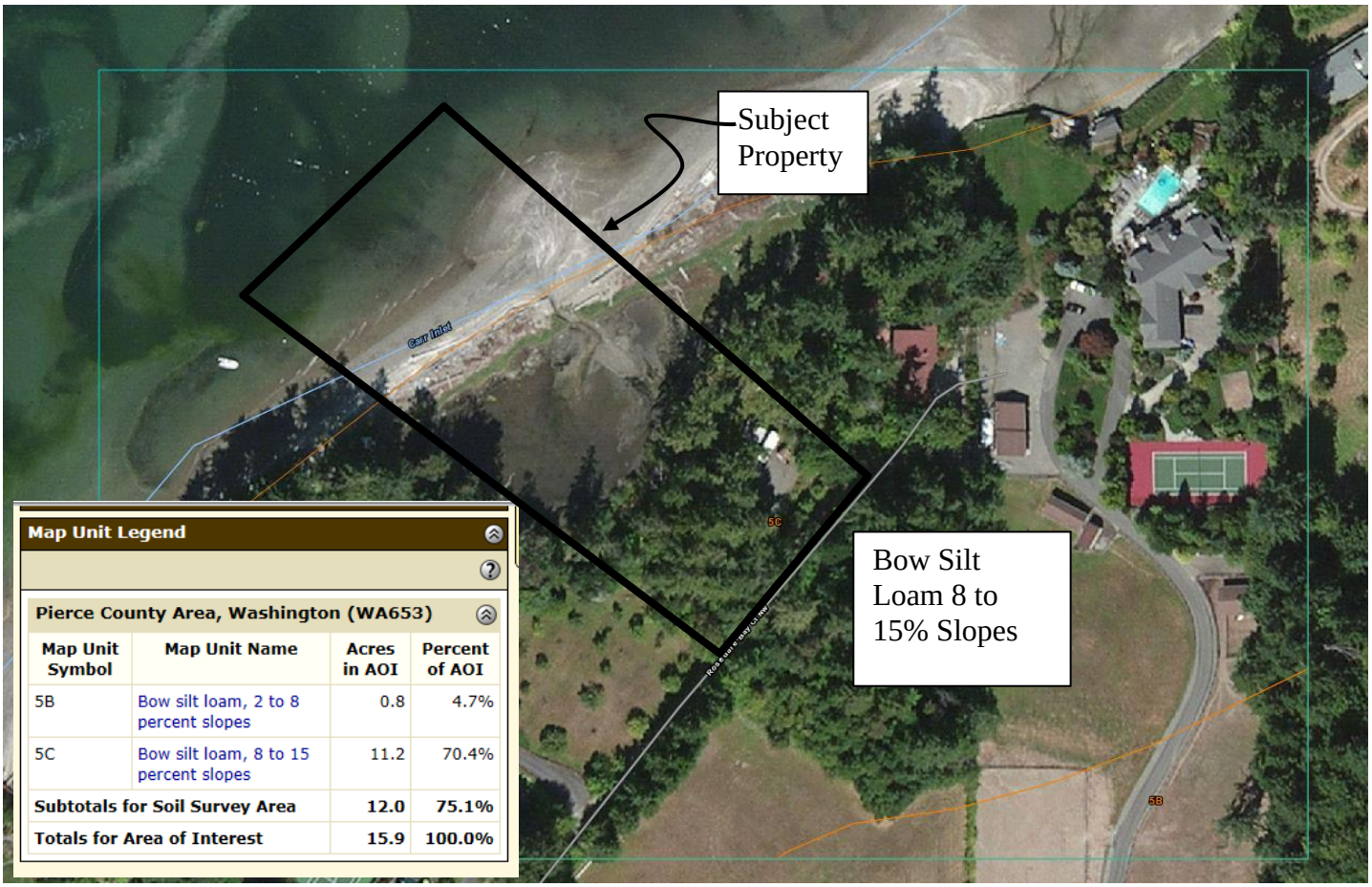

Wetlands
Hydro - Centerlines
Tax Parcels
Subject Property
10 m
50 ft

APPENDIX E

Natural resources conservation service

(NRCS)

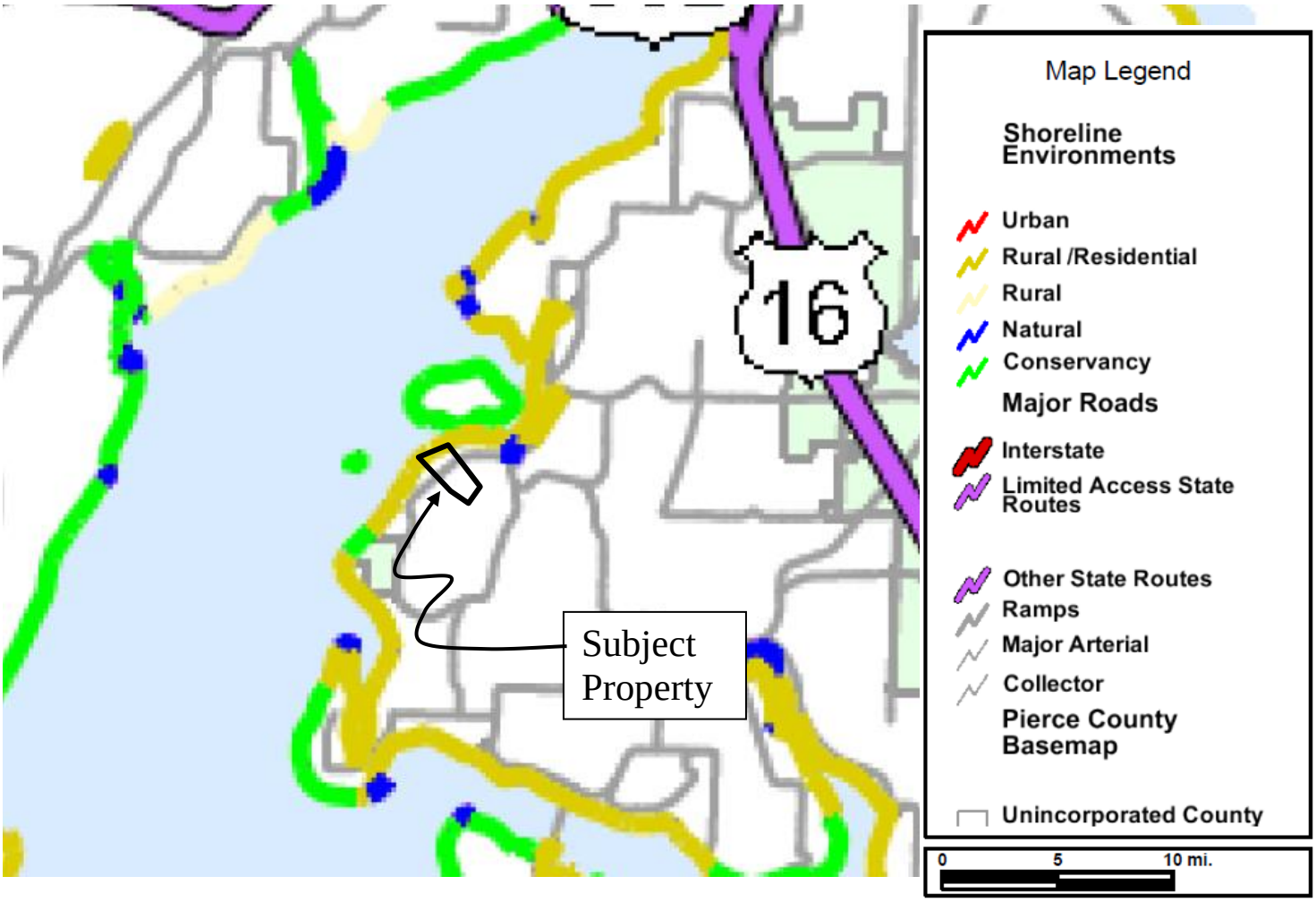
Soils Map


Subject Property
Bow Silt Loam 8 to 15% Slopes
Map Unit Legend
Pierce County Area, Washington (WA653)
Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI
5B | Bow silt loam, 2 to 8 percent slopes | 0.8 | 4.7%
5C | Bow silt loam, 8 to 15 percent slopes | 11.2 | 70.4%
Subtotals for Soil Survey Area | 12.0 | 75.1%
Totals for Area of Interest | 15.9 | 100.0%

APPENDIX F

Pierce County

Shorelines Map


16
Subject Property
Map Legend
Shoreline Environments
Urban
Rural /Residential
Rural
Natural
Conservancy
Major Roads
Interstate
Limited Access State Routes
Other State Routes
Ramps
Major Arterial
Collector
Pierce County Basemap
Unincorporated County
0
5
10 mi.

APPENDIX G

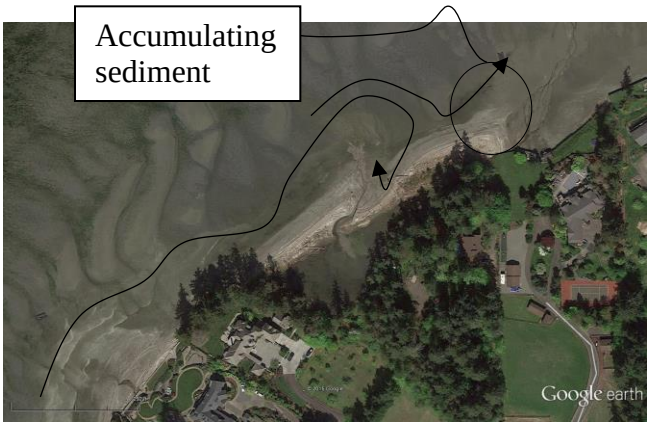
Aerial photos

Demonstrating

the direction of Marine Currents

and longshore drift

over time



Aerial photo 2015

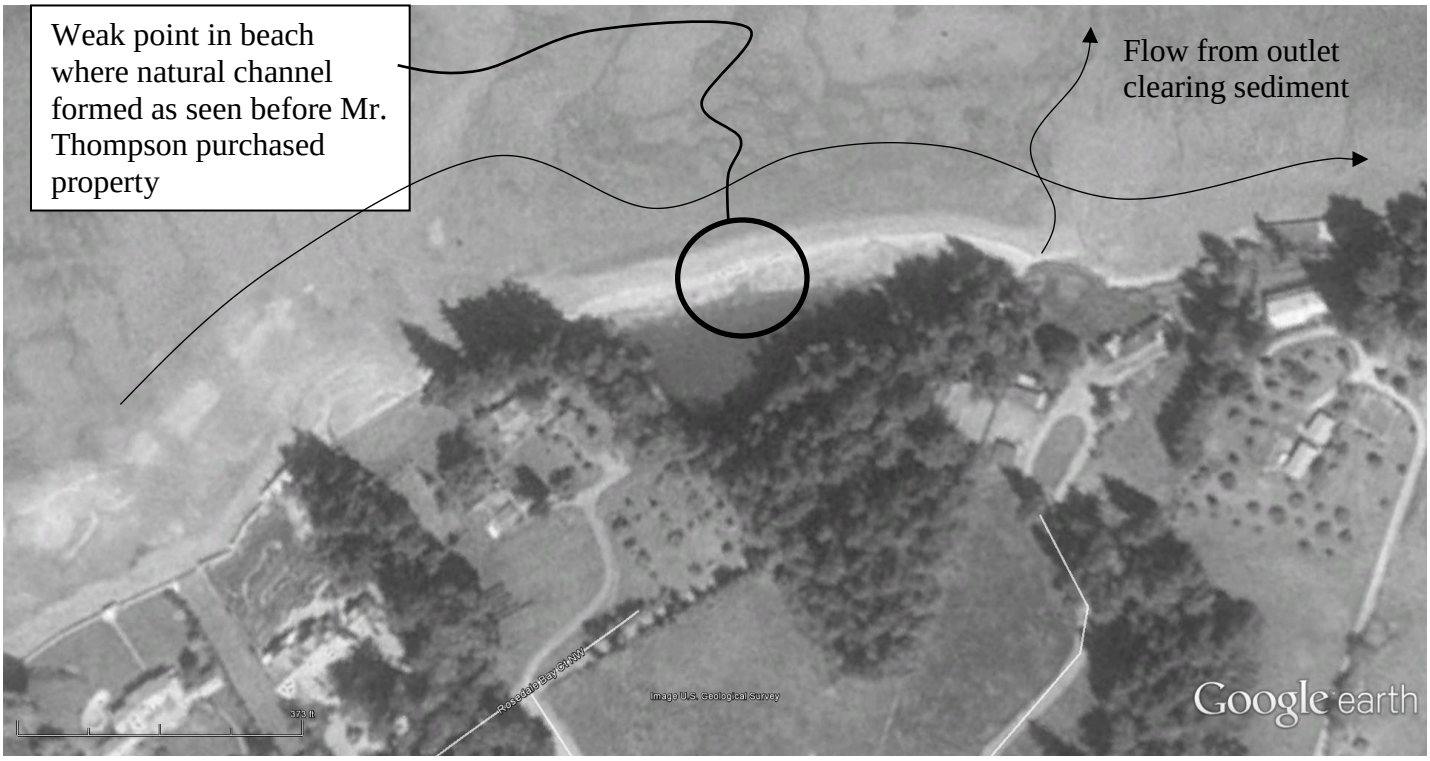
Aerial photo 2014

Aerial photo 2013

Aerial photo 2010

Aerial photo 2009

Aerial photo 2005



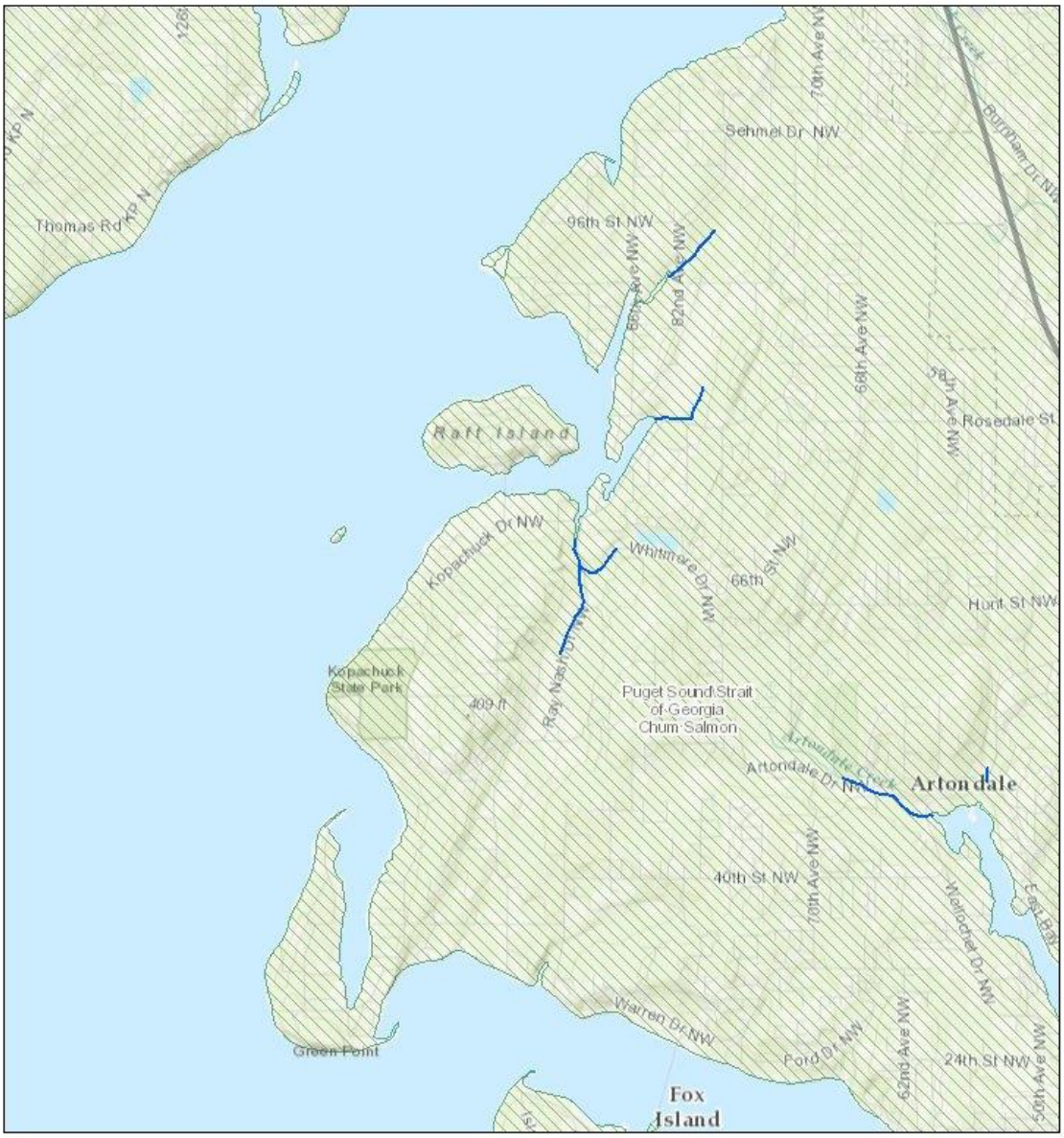
Aerial photo 1990

Appendix H

Salmonid ESU's

That may occur in Lagoon

Fall Chum ESU



January 5, 2016

1:72,224

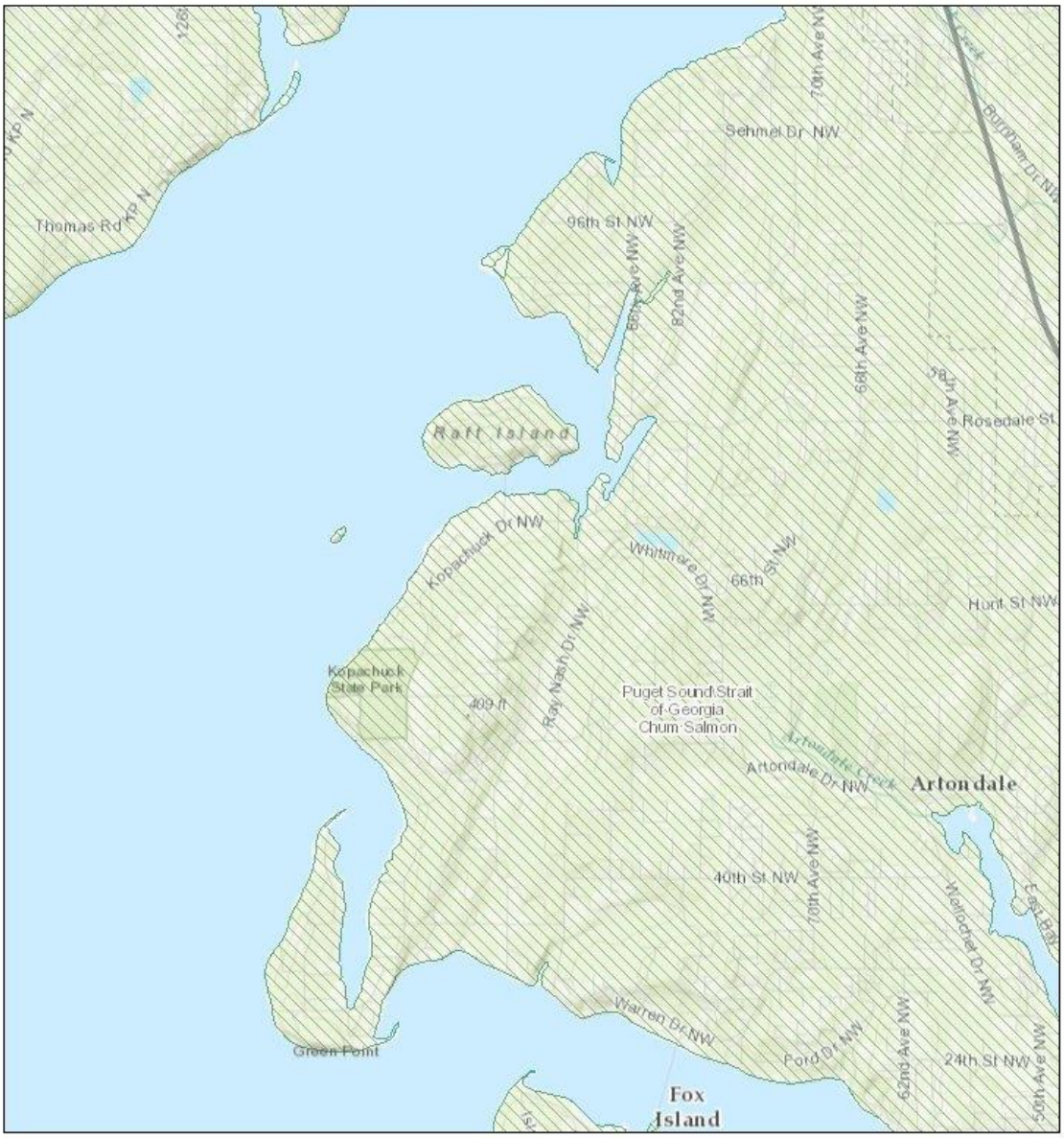
0 0.5 1 2 mi

0 1 2 4 km

- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Presence
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Presence
- Documented-Artificial, Spawning
- Documented-Artificial, Rearing

Sources: Esri, HERE, DeLorme, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
NOAA, USFWS

Winter Chum ESU



January 5, 2016

1:72,224

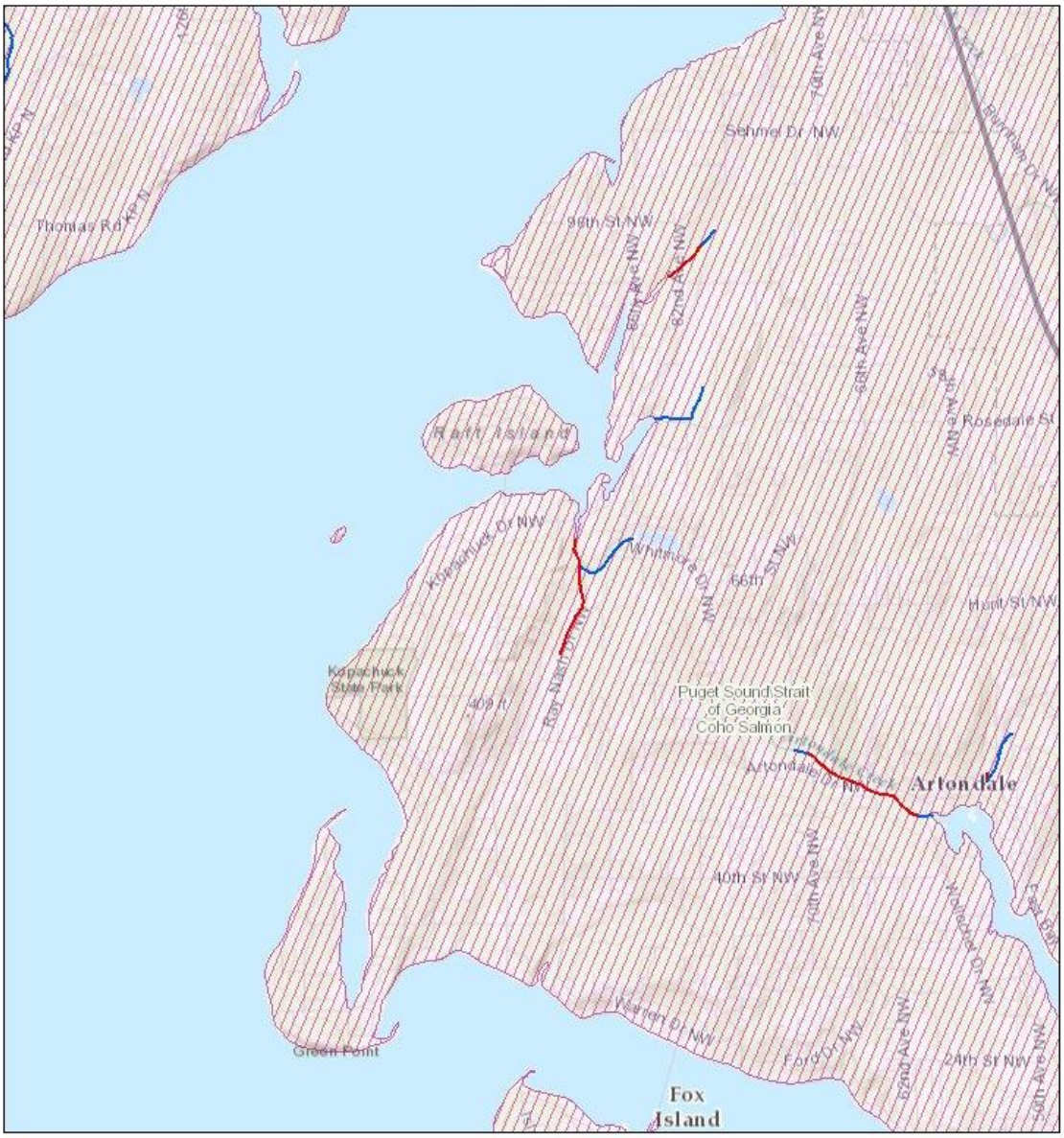
0 0.5 1 2 mi

0 1 2 4 km

- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Presence
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Presence
- Documented-Artificial, Spawning
- Documented-Artificial, Rearing

Sources: Esri, HERE, DeLorme, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
NOAA, USFWS

Coho Salmon ESU



Pink Salmon Odd Year

January 5, 2016

1:72,224

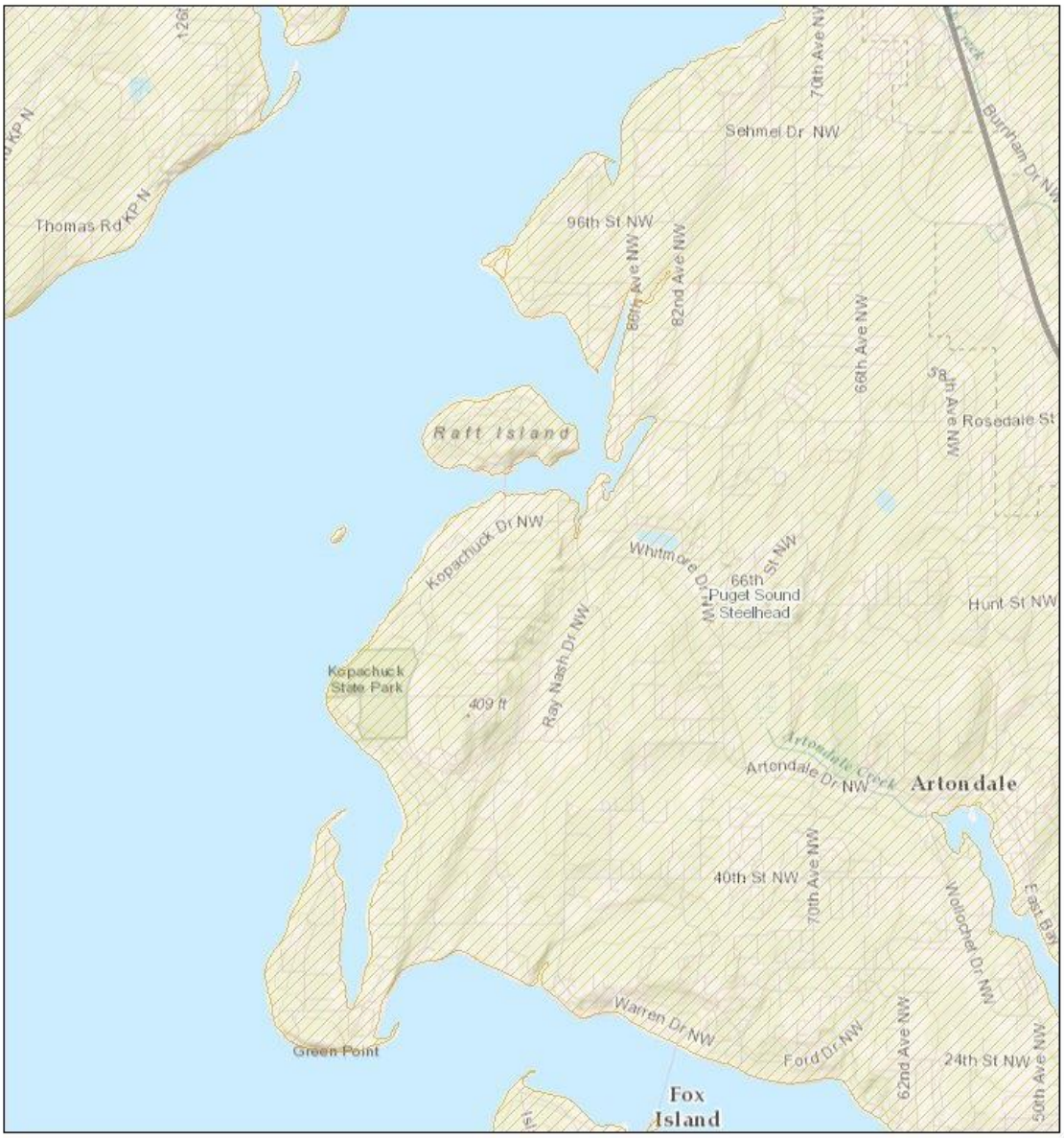
0 0.5 1 2 mi

0 1 2 4 km

- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Presence
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Presence
- Documented-Artificial, Spawning
- Documented-Artificial, Rearing

Sources: Esri, HERE, DeLorme, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
NOAA, USFWS

Winter Steelhead ESU



January 5, 2016

1:72,224

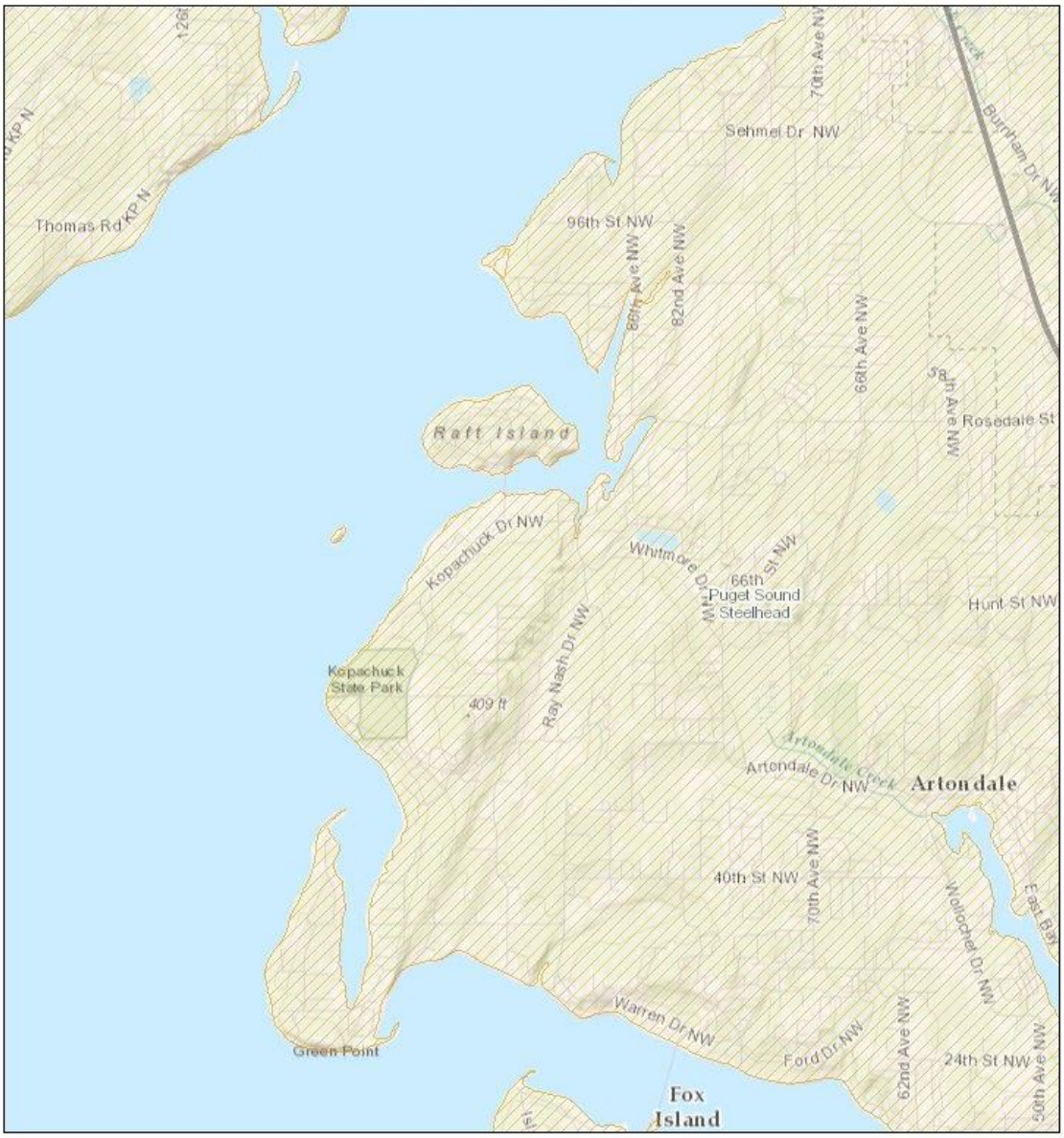
0 0.5 1 2 mi

0 1 2 4 km

- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Presence
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Presence
- Documented-Artificial, Spawning
- Documented-Artificial, Rearing

Sources: Esri, HERE, DeLorme, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
NOAA, USFWS

Summer Steelhead ESU



January 5, 2016

1:72,224

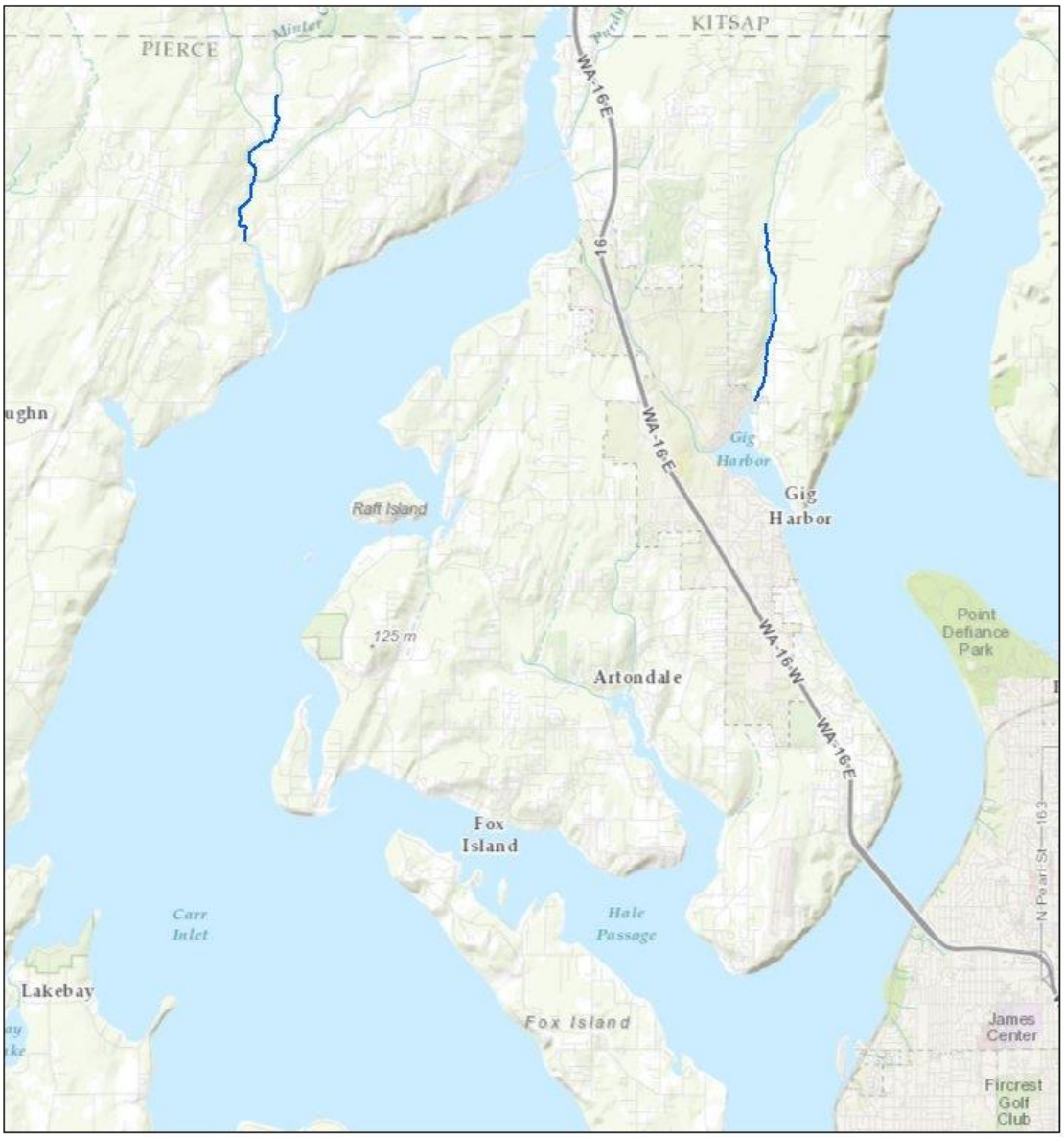
0 0.5 1 2 mi

0 1 2 4 km

- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Presence
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Presence
- Documented-Artificial, Spawning
- Documented-Artificial, Rearing

Sources: Esri, HERE, DeLorme, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
NOAA, USFWS

Fall Chinook Streams



January 5, 2016

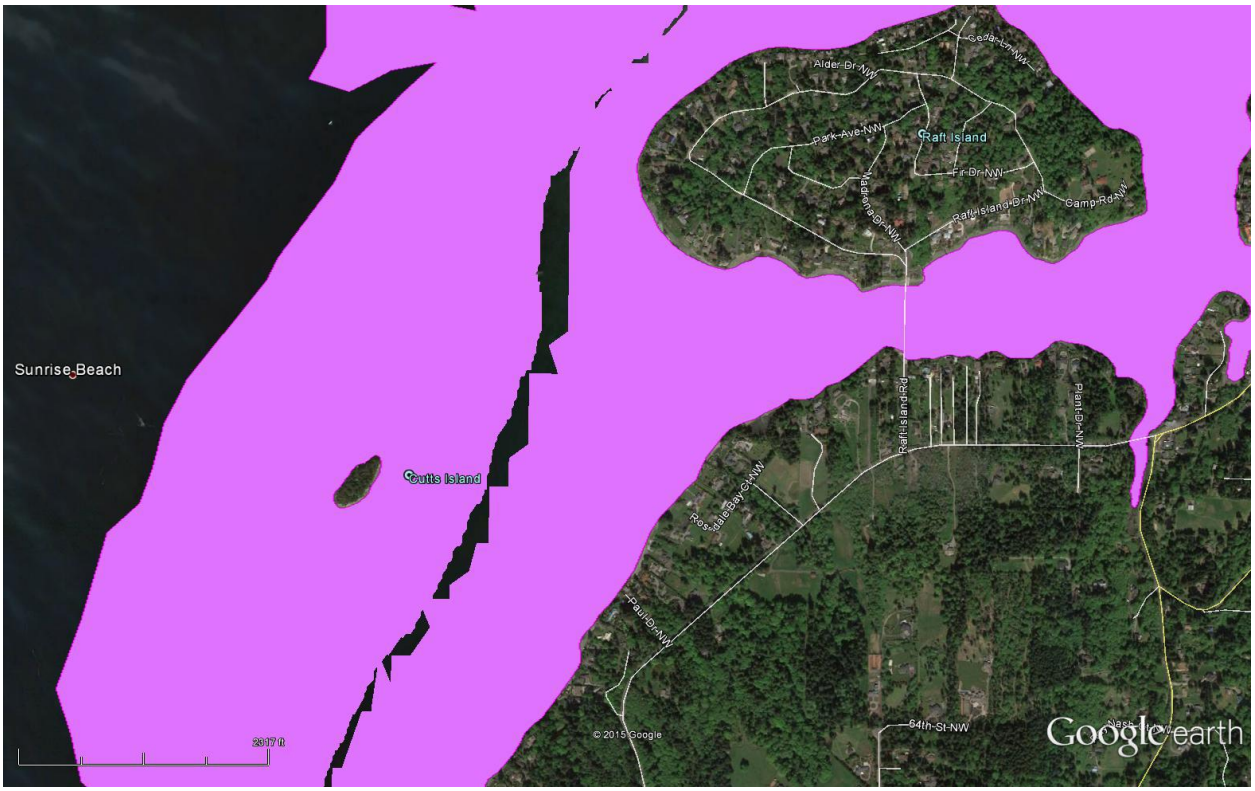
1:144,448

0 1.25 2.5 5 mi

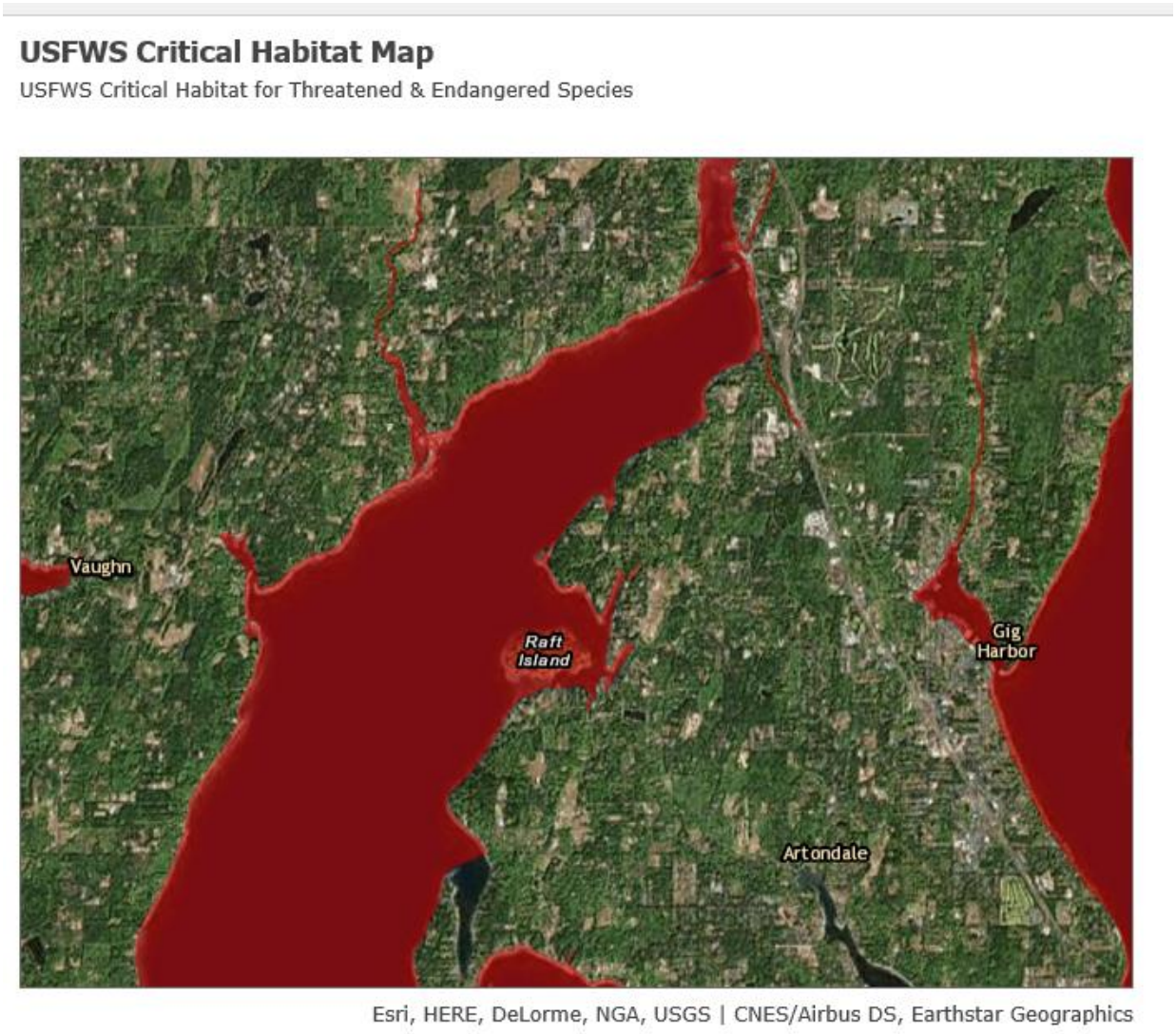
0 2 4 8 km

- Documented Presence
- Documented Spawning
- Documented Rearing
- Modeled Presence
- Presumed Presence
- Potential: Blocked
- Documented Historic Presence
- Transported Presence
- Transported Spawning
- Transported Rearing
- Documented-Artificial, Presence
- Documented-Artificial, Spawning
- Documented-Artificial, Rearing

Sources: Esri, HERE, DeLorme, Intermap, Increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
WDFW



Chinook Critical Habitat



Bull Trout Critical Area